# IV. NOTE ON SOME AMPHIBIOUS COCKROACHES.

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Early in 1908, Dr. Nelson Annandale forwarded to me a tube of spirit containing four examples of cockroaches which he had found in a jungle stream in the Dawna Hills of Lower Burma and asked me to report on them. Three of the specimens are larval forms of a species of *Epilampra*, and the fourth is an adult winged male, also of the genus *Epilampra* and apparently new to science. Dr. Annandale, in a letter to me on the subject of these cockroaches, writes :—" The wingless specimens were under stones in a small jungle stream and behaved just as the one I obtained in Chota Nagpur did.[1] The winged specimen was under a stone at the edge of the stream, but swam readily when pursued. It did not seem so much at home in the water, however, and apparently could not, owing to its wings, raise the tip of its abdomen above the surface." The wingless specimens are male larvæ, and exhibit the same modifications for an amphibious life as I have described them in very similar larvæ from Borneo[2]; that is to say, the terminal abdominal spiracles are situated at the base of two tubes projecting from below the seventh abdominal tergites. I have nothing further to add to that account beyond stating that the genus *Rhicnoda* can be distinguished from *Epilampra* by the forward production of the pronotum which completely covers the head, whereas in *Epilampra* the vertex of the head is exposed ; adult males of *Rhicnoda* have not yet been recognised with certainty. It is quite evident that some species of *Epilampra* are amphibious in their early stages and probably all the species of *Rhicnoda* are amphibious throughout the whole of their life. At first I was inclined to believe that the larvæ sent me by Dr. Annandale were the young stages of the adult male, in spite of the different shape of the pronotum and the greater breadth of the abdomen in the larvæ, for we know that the larvæ of the species of *Gyna*, an African genus of cockroaches, differ from their adults just in these very characters. But after a careful examination I have come to the conclusion that Dr. Annandale's specimens constitute two distinct species. Mr. J. Mangan, in a paper " On the mouth-parts of some Blattidæ,"[3] has described some peculiar processes that occur on the inner edge of the lacinia of the maxilla. These processes sometimes afford valuable characters for discriminating

[1] *J. Asiat. Soc. Bengal* (N. S.), ii, pp. 105-106 (1906).
[2] *Zoologist*, June 1907.
[3] *Proc. R. Irish. Acad.*, xxvii, Sect. B, No. 1 (1908).

species ; in closely allied species such as *Ectobius lapponicus*, L., and *E. perspicillaris*, Herbst, they appear to be identical, but though I have examined a considerable number of species, I have not yet found the processes to differ in structure in the same species at different stages in its life-history. Since these processes differ in the larvæ and in the adult submitted to me by Dr. Annandale (text-figs. 1 and 2), I am consequently of opinion

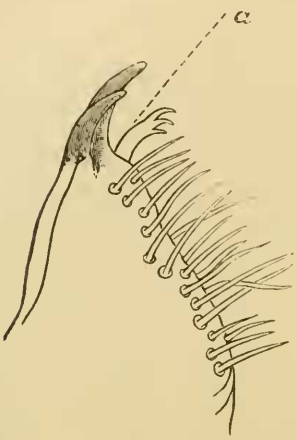


Fig. 1.

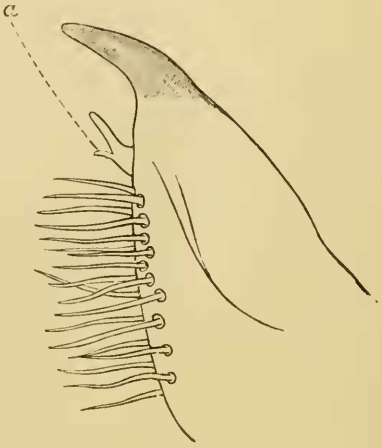


Fig. 2.

Fig. 1.—Right lacinia of *Epilampra annandalei*, ♂, inner aspect, × 100.
,, 2.—Right lacinia of *Epilampra* sp., larva, outer aspect, × 100.
*a* = process of lacinia.

Note.—The bifid tip of the lacinia shown in fig. 2 is hidden beneath the large outer tooth.
Drawn with the camera lucida.

that the larvæ and adult must be referred to two quite distinct species. The adult exhibits no modifications whatever for an aquatic or amphibious life, the legs are not adapted for swimming and there is no sign of spiracular tubes projecting from beneath the seventh abdominal tergites as in the larvæ. As the tegmina and wings project beyond and cover the tip of the abdomen, the cockroach would not be able to rest below the surface of the water and at the same time draw in its air-supply through the terminal spiracles as can the larvæ, and I very much doubt if it can even swim below the surface of the water. Dr. Annandale's remarks in another letter to me on the swimming habits of this cockroach are worth quoting here :—" The cockroaches were collected on a very hurried trip and I had little opportunity to study them. I am sure, however, that the winged form could only swim on the surface. It took to the water as most, or at any rate very many, of the smaller Indian Orthoptera will, if hard pressed. This is true of most Acridiids and many smaller Locustids and I think of nearly all crickets and many cockroaches, though perhaps to a less extent in the cockroaches. . . .Many Indian cockroaches, especially

Epilampridæ, live in damp places near the edge of jungle streams and do not mind getting wet. It is astonishing what a large proportion of insects can swim well if they are forced to do so, and I think that in India there is a very marked tendency for members of terrestrial groups of all kinds to become aquatic or amphibious." From observations in Borneo I can confirm Dr. Annandale's remarks, for I have frequently seen species of *Tettix* (*s. l.*) and *Tryxalides* take to the water when disturbed.

I have much pleasure in naming the new species after its discoverer.

*Epilampra annandalei*, sp. nov.

♂. Rufo-castaneous. Vertex of head freely exposed, finely dotted with fuscous; eyes wide apart. Pronotum trapezoidal, posteriorly produced obtusely, finely dotted with fuscous, smooth, litid. Tegmina exceeding the apex of the abdomen, unicolorous, impunctate. Wings with marginal area flavous, ulnar vein with fifteen rami, four being complete. Abdomen rufo-testaceous, supra-anal lamina produced, subquadrate, apex slightly emarginate, subgenital lamina rather large, produced, slightly asymmetrical, with two slender styles. Cerci long, acuminate. Femora strongly armed: front femora armed on anterior margin beneath with seven spines succeeded distally by filiform setæ; four spines on posterior margin. Formula of apical spines, $\frac{2}{1}$, $\frac{1}{1}$, $\frac{1}{1}$. Posterior metatarsi very long, exceeding the remaining joints in length, completely bi-serrulate beneath, second tarsal joint also armed beneath; all the pulvilli minute, apical.

Total length 20 mm.; length of body 12 mm.; length of tegmina 16 mm.; pronotum 41 mm. × 5 mm.

This species belongs to the group characterised by the small size, impunctate pronotum and elongate metatarsi; its nearest allies are *E. fervida*, Walk., *E. quadrinotata*, Walk., *E. geminata*, Br., and *E. flavomarginata*, Shelf. The larvæ cannot be referred with certainty to any known species, since we are almost entirely ignorant of the metamorphoses of any Blattidæ, but it would be unwise to describe a new species based only on immature forms, and for the present they must remain without a name.